The experiments on the spatial perception of two simultaneous sounds of similar quality are of special interest. Such sounds coalesce and give rise to a resultant or, as Prof. Pierce aptly calls it, phantom sound. As a rule this phantom sound is located at a position intermediate between those to which the observer would refer the two real components. These experiments with two coalescing sounds, not being liable to the same extent as those with one sound to the error introduced by unconscious movements of the head, may be of use to check such errors and to show that they exist. A very curious case, or set of cases, is examined by Prof. Pierce, who gives very fully the results of his own experiments and of those of other investigators. When the two component sounds, one on each side, are produced near the ears (4 cm. or less from each ear), the phantom is heard *within the cranium* and can be made to move inside the head towards the one or the other ear by varying the relative loudness of the components. When the distance of the two sounds from each of the ears is 8 cm. or more, the phantom is extra-cranial.

What seemed the most interesting points discussed in this essay have been noted; but the whole of it is interesting, and physicists and physiologists will find it well worth careful reading. The fairly complete bibliography annexed to it greatly adds to its value.

The second part of the book deals with some optical illusions, which are discussed with great critical acumen.

ALEX. CRUM BROWN.

THE MORPHOLOGICAL VALUE OF THE CENTROSOME.

Das Problem der Befruchtung. Von Dr. Th. Boveri. Pp. 48. (Jena: Gustav Fischer, 1902.) Price Mk. 1·80.

PROF. BOVERI is so well known as a cytologist that anything from his pen will be read with interest. He is concerned in the little work before us in presenting in a non-technical fashion the main morphological peculiarities connected with fertilisation, and he also discusses the meaning of the processes involved. The appendix will probably be regarded by many as the most interesting part of the whole, as he there critically examines the results which have been obtained by Loeb on artificial parthenogenesis, and which have been confirmed and further investigated by Wilson. It will be within the recollection of some people that Loeb discovered the important fact that it is possible to induce normal development in *unfertilised* eggs of certain marine animals by treating them for some time with a 12 per cent. solution of magnesium chloride in seawater, and then retransferring the eggs to normal seawater. Morgan and others had previously found that the addition of salts of various kinds to the water sufficed to produce bodies remarkably like centrospheres, but it was not until Wilson showed this also to occur in Loeb's experiments, and that they almost certainly initiate the process of segmentation, that the significance of the earlier results became apparent.

Now the egg is normally destitute of any centrosome, and it has been thought on many grounds that one of the chief uses of the sperm was to import this body into the protoplasm of the inert ovum. Boveri himself first put forward this view, and he now seems inclined to admit that it may demand some degree of modification. His original conception of the sperm as starting the cytoplasmic activities remains untouched, but obviously the nature of the mechanism involved is, as he says, open to a different interpretation from that originally assigned to it by himself. For it may now be fairly argued that it is not a centrosome as an *organised structure* which is introduced into the egg, and which there starts the segmentation processes, but rather a chemical substance which, in combination with the ovian cytoplasm, produces the body in question. Such a view would reconcile much that has hitherto been difficult of explanation in connection with the diverse behaviour of centrosomes in different organisms, and even in different cells and tissues of the same individual.

In cycads, for example, centrosome-like structures (blepharoplasts) are associated with the karyokinesis of the generative cell of the pollen tube, but they are absent from the rest of the antecedent cell-generations. Hence their morphological permanence can hardly be seriously maintained in such a case as this. Again, in many of the higher plants the spindle fibres which appear in the early prophases of karyokinesis (*e.g.* in pollen-mother cells of the lily) originate at many different spots in the cell, and this may probably be correlated with the extrusion of nucleolar substance which was described in this instance as long ago as 1893. Furthermore, such a conception of the possible nature of centrosomes enables one to harmonise the peculiar quadripolar spindles so characteristic of the lobed spore-mother cells of many liverworts.

It is clear, of course, that the acceptance of such a possible origin of centrosomes does not necessarily involve a denial of their possible permanence in other cases. But it does add another striking example to those cases in which a morphological character may be traced to physiological causes, the character itself only persisting for so long as the physiological stimulus continues to operate.

J. B. F.

ROSE CULTURE.

The Book of the Rose. By the Rev. A. Foster-Melliar. Second edition, with 33 illustrations. Pp. xiv + 352. (London: Macmillan and Co., Ltd., 1902.) Price 6*s.*

THE design of the author is "to show how roses may be grown in the best possible manner so as to produce the finest blooms"; and from his enthusiastic love and his long, successful culture of the flower, he has written such an exhaustive treatise that the reader who has the ambition, the energy and the means to follow his instructions cannot fail to achieve success. He gives clear and comprehensive details as to soil, situation, selection and treatment, where to erect a throne for the queen of flowers, and the homage which must be paid by those devoted subjects who would win her most gracious smiles. With a loyal service, which is never disheartened, the knight of the rose must be eager to maintain her supremacy against all comers. Without metaphor, he who would grow roses in their perfect beauty, and, like the author of this book, would be rewarded with medals and trophies, must obey the immutable law, must work for his wage, must train for the race if he would so run that he

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may obtain the prize; he must dig and drain and enrich the soil, must plant, protect and prune, and, like the husbandman, he must have long patience before the harvest comes. He must be prepared for failures and disappointments, for nipping frosts and scorching suns, hailstones and drenching rains, for blight and mildew, fungus and thrip, for aphis and grubs, spiders and beetles, suckers and weeds. The obstacles are many, and the enemies are fierce, as ever to those who would attain excellence.

But perseverance will prevail, and he who has an expert for his guide will reach the summit, however steep may be the mountain. He who has a productive soil, a situation sheltered but not overshadowed, an atmosphere not polluted by smoke or smut, who adds to these inseparable adjuncts of success a determination to succeed, and then follows, in strict obedience, the teaching of Mr. Foster-Melliar, will repeat his achievements; the pupil will become a professor, and the entered apprentice will be a master-mason.

On the subject of "garden roses," roses which have not the perfect symmetry and fulness required for exhibition at our shows, the author declares that he is no authority, and he tells us little or nothing of their infinite variety and beauty in beds, borders and shrubberies, on pillars, pergolas and walls; but as a manual for the production of those roses, which have been most admired by rosarians, in their loveliest form, his admirable essay is complete.

OUR BOOK SHELF.

The Birds of North and Middle America. Part i. "The Fringillidæ." By R. Ridgway. *Bulletin* U.S. Museum, No. 50. Pp. 715; 20 plates. (Washington, 1901.)

MR. RIDGWAY is such a well-known authority on the birds of North America that anything coming from his pen is sure to obtain a welcome at the hands of his brother ornithologists. The size of the present volume, which, as stated in its title, deals only with a single family, affords an index of the bulk and extent of the work of which it forms the commencement. The amount of labour involved in such a task is enormous and can only be properly appreciated by working naturalists. Preparations for the work, the author tells us, have been in more or less active progress for the last twenty years, and so long ago as the autumn of 1894 the task of putting together in proper form for press the vast accumulation of material was taken in hand. The labour of measuring specimens of more than 3000 forms of birds and making the necessary references to previous descriptions was, however, so vast that it has only been possible to issue the first part after this long lapse of time. It is hoped, now that much of the drudgery is accomplished, future progress may be more rapid.

The object of the work is to describe in detail every definable form of bird—whether species or subspecies—met with on the American continent, from the Arctic districts to the eastern end of the Isthmus of Panama, together with the West Indian and Galapagos Islands. Moreover, besides the indigenous denizens of the area, the accidental or casual visitors, as well as artificially introduced species, are included, so that the list is as full and comprehensive as possible. Needless to say, the work is written on modern American lines, so that the number of forms regarded as entitled to distinction is very great; while the number of genera and subgenera is likewise unusually large. An especial feature of the work is the large number of forms which are relegated to the rank of subspecies.

As regards the description and keys to the different groups and species, the work appears to be admirably written, the number of specimens of which the measurements are given rendering it especially valuable. Perhaps it was somewhat unnecessary to give a general account of birds and their various orders, but this is a fault on the right side, and the work should prove invaluable to all zoologists on both sides of the Atlantic. In replacing the name "Central America" by the unfamiliar "Middle America" the author may be etymologically right, but if this be the reason of the innovation, it is somewhat curious to find such a change advocated by American naturalists, who are notorious for the contempt with which they treat the synthesis and orthography of scientific names. R. L.

The Lens. A Practical Guide to the Choice, Use and Testing of Photographic Objectives. By T. Bolas, F.C.S., F.I.C., and George E. Brown, F.I.C. Pp. vi + 176. (London: Dawbarn and Ward, Ltd., 1902.) Price 2*s.* 6*d.* net.

THIS is a useful book, not only for beginners in the use of the camera, but for many photographic workers who have never studied the optics of lenses. The elementary treatment of lenses is far in advance of that of most professed English text-books of optics, as from the outset it does not make the assumption of an infinite thinness of lenses, but treats them by the method of Gauss by means of principal planes and principal points. Unfortunately, the authors persist in calling the principal points "nodal" points, a confusion of language which will puzzle students if when they come to the eye they discover that the nodal points of that organ are not the same as the principal points. There are good discussions of the subjects of angle of view, inequality of illumination and "depth of focus." We are glad to see that the authors have summoned up courage to omit "indigo" from the tints of the spectrum. It has long been recognised that there is no indigo tint between the blue and the violet. It is a pity that the authors admit the vulgarism in chapter iv. of writing the aperture-ratios *f*/24, *f*/16, &c., as *f*24, *f*16, &c. On p. 49 they give the notation correctly. The lens diagrams would be improved by cross-hatching the sections of the lenses; it is impossible by looking at the mere outline, for example, of the composite back lens of Fig. 104A, on p. 91, to tell whether it represents three lenses cemented together or two lenses separated by an air-space. The practical hints on focussing, copying and enlarging are excellent; and we quite concur in the advice on p. 95 to avoid second-hand lenses. Some admirable examples of the performance of lenses are reproduced in half-tone blocks. That of King Henry VII.'s Chapel on p. 171 is really marvellous.

A Text-book of Geology. By Albert Perry Brigham, A.M., F.G.S.A., Professor of Geology in Colgate University. Pp. 477; illustrated. (London: Hirschfeld Brothers, Ltd., 1902.)

ALTHOUGH this work bears on its title-page the name of a London publisher, it is evidently prepared with a view to the requirements of teachers and students in the United States. It forms one of the "Twentieth Century Text-books" edited by Dr. A. F. Nightingale, formerly of Chicago. According to its author's preface, this text-book has been especially prepared as an elementary treatise for secondary schools in America, and it seems admirably adapted for this purpose. While modestly disclaiming any great originality in the plan of the work or novelty in the mode of treatment of geological problems, the author may be

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